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The WARNER & SWASEY COMPANY

1880 ✻ 1920

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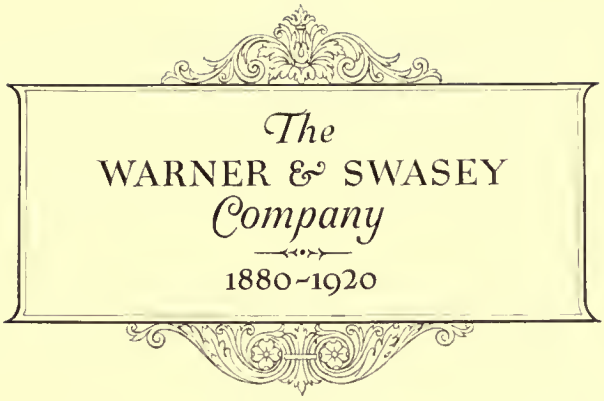
The
WARNER & SWASEY
Company
1880-1920

Warner & Swasey Company

The WARNER & SWASEY *Company*

1880-1920

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Fortieth Anniversary Celebration

CLEVELAND

OHIO

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FOREWORD

TO record the celebration of the Fortieth Anniversary of the founding of the firm of WARNER & SWASEY, *and to present briefly the history of the development and character of the business, this volume is published. It has been prepared for distribution to the members and employees of* THE WARNER & SWASEY COMPANY, *and the many friends who join in celebrating this occasion.*

Two distinctive periods mark the development and achievements of the business—the Partnership, 1880-1900; and the Corporation, 1900-1920. After association as partners for twenty years, Mr Warner and Mr Swasey recognized that to realize their desire for continued development, they must build an organization that would carry on when the passing of time might demand a lessening of their individual effort. The corporation which resulted, celebrates on this occasion the completion of its twentieth year, and at the same time, the fortieth anniversary of the original partnership.

The character of the business finds expression in the succeeding pages of this book, which portray some of the results of nearly half a century of mechanical, engineering and scientific progress.

In keeping with the traditions of the business, it has, from the beginning, been the policy of the founders to attain the highest standards in its product, whether Machine Tools, great Telescopes or other instruments of precision. While the nature of the product has been somewhat varied, its high standard throughout has been invariable.

On this anniversary of the establishment of the business, the founders are happy and grateful that it has been their privilege to lay a broad and solid foundation of lasting achievement. They are also keenly appreciative of the devotion of their employees and co-workers, and in the spirit of friendly celebration offer this book as a symbol of mutual good will and esteem

CLEVELAND, OHIO
MAY, 1920

The FOUNDERS

The FOUNDERS

ON this fortieth anniversary of the partnership of WORCESTER R. WARNER and AMBROSE SWASEY, it seems fitting that something be said about the deeper significance of their long and happy association, which covers, altogether, fifty-five years.

Rarely have two lives moved with such unity of spirit and purpose. Although they did not know each other until they had grown to be young men, their habits of study and characters appear to have developed in astonishing parallel, almost from boyhood. Born on New England farms, in the same year, they worked on the land like their pioneer ancestors; and that pioneer blood in them responded equally to the stirring of a new age that was taking shape during their boyhood—the Age of Mechanical Achievements.

The two farm lads felt something of the greatness of the new day. It was not the mechanic's trade, as a possible livelihood, that interested them chiefly, it was Machinery as a means to an end, as a servant to mankind.

Their meeting was in itself one of the many parallelisms in their lives. They had, independently, determined at about the same time to leave the farm for industry, and they entered the same machine shop as apprentices within a few months of one another, in the same year, at the same age of nineteen. The apprentice in those days was viewed more as a convenient drudge than as an asset to be made into a valuable entity, and the two farmer boys had the same ample lack of opportunities as their comrades.

But machinery was being produced before their eyes, and if there were few attempts to teach, there were at least no attempts to prevent them from learning. What one thus learned, he passed on to the other. Thus the interest in and knowledge of astronomy on the part of one of the lads inspired the other, and later led to that united work which was to grant them the high privilege of serving that great science. The Lick, Yerkes, United States Naval and Canadian telescopes were born then, though the two apprentices did not dream it.

The thousands of machine tools and instruments of precision that have been produced by them and their organizations were parts of the same conception of the nobility of labor and of honorable pride in execution. That their success in inventing and manufacturing machine tools has been augmented by the construction of great telescopes is only incidental. The great measure of the successful human life is the usefulness of its deeds; and it is in that sense that the scientific achievements fall truly into place with all else that they have tried to do in their long partnership.

In this fortieth anniversary celebration their deepest happiness comes not from the extent of their works, or from any worldly fame that has accrued to them. They look back over the long span with gratitude that they were fortunate enough to go measurably in the right way, and that, as a result, the world is able to do some useful things better than they had been done before.

WORCESTER R. WARNER

Worcester Reed Warner was born May 16, 1846, near Cummington, Massachusetts, and was educated in the rural district school. At the age of 19 he found his first employment in the Boston drafting room of a machine works, but soon obtained his transfer to the company's shops in Exeter, New Hampshire. Here he made friends with Ambrose Swasey, and on the completion of their apprenticeship in 1870, both young men entered the employ of Pratt & Whitney in Hartford, Connecticut.

After a short time, Mr. Warner was placed in charge of one of the firm's largest departments, and when the Centennial Exposition was held in Philadelphia he was entrusted with the management of the company's exhibit there. After working for a time as foreman, he undertook, according to the custom in those days, to build machines under contract, and he attracted attention, among other things, by greatly reducing the production time.

Astronomy had been his delight in youth, and his mother had encouraged his study and inspired him to construct crude telescopic models with such means as were available. He continued his research and experimentation during his apprenticeship, and later in Hartford he succeeded in finding time to make decided progress. A mounting for a portable telescope which he constructed then during his leisure hours was so successful a piece of apparatus that he followed it by building a larger and more powerful instrument.

A charter member of the American Society of Mechanical Engineers, he was its President in 1897. He is a past President and honorary member of the Cleveland Engineering Society, a member of the British Astronomical Society, and

of the American Astronomical and Astrophysical Society, a Fellow of the Royal Astronomical Society, and of the American Association for the Advancement of Science. Among other honors he has received the degree of Doctor of Mechanical Science.

His activity in the business, financial and general community life of Cleveland has given him such positions as Vice President of the Society for Savings, Director of The Guardian Savings and Trust Company, member of the Advisory Board of The Citizens Savings and Trust Company, trustee of Case School of Applied Science, trustee of Adelbert College, of Western Reserve University and of the Cleveland School of Art, member of the Advisory Board of the Cleveland Museum of Art, and past President of the Cleveland Chamber of Commerce.

AMBROSE SWASEY

Ambrose Swasey, born near Exeter, New Hampshire, on December 19th, 1846, obtained his school education from the rural district school and developed early interest in mechanical problems, experimenting with the few farm implements of the time and growing more and more eager to produce intricate machinery. He entered his apprenticeship in the Exeter Machine Works in 1865.

After he entered the employ of Pratt & Whitney, he perceived and studied a field for invention in the unsatisfactory method then used for cutting gears. While in charge of the Gear Cutting Department of that firm, he devised and constructed the Epicycloidal Milling Machine for producing true theoretical curves from which cutters for gear teeth are made. He invented also a new gear-cutting machine for generating and at the same time cutting the teeth of spur gears, the process being a solution of the difficult problem in the interchangeable system of gearing.

Among his later contributions to science is the design of the Warner & Swasey Automatic Dividing Engine. He also invented the Swasey Depression Position Finder for seacoast defense fortifications.

Many honors have been conferred upon Mr. Swasey. In 1900, the decoration of Chevalier of the Legion of Honor was bestowed upon him by the French Government. In 1905, Case School of Applied Science, Cleveland, conferred upon him the degree of Doctor of Engineering, and in 1910 he received the degree of Doctor of Science from Denison University, Granville, Ohio. He was one of the forty-eight men who organized the American Society of Mechanical Engineers. He served as President of the Society in 1904, and in 1916 was made an honorary member. He is a

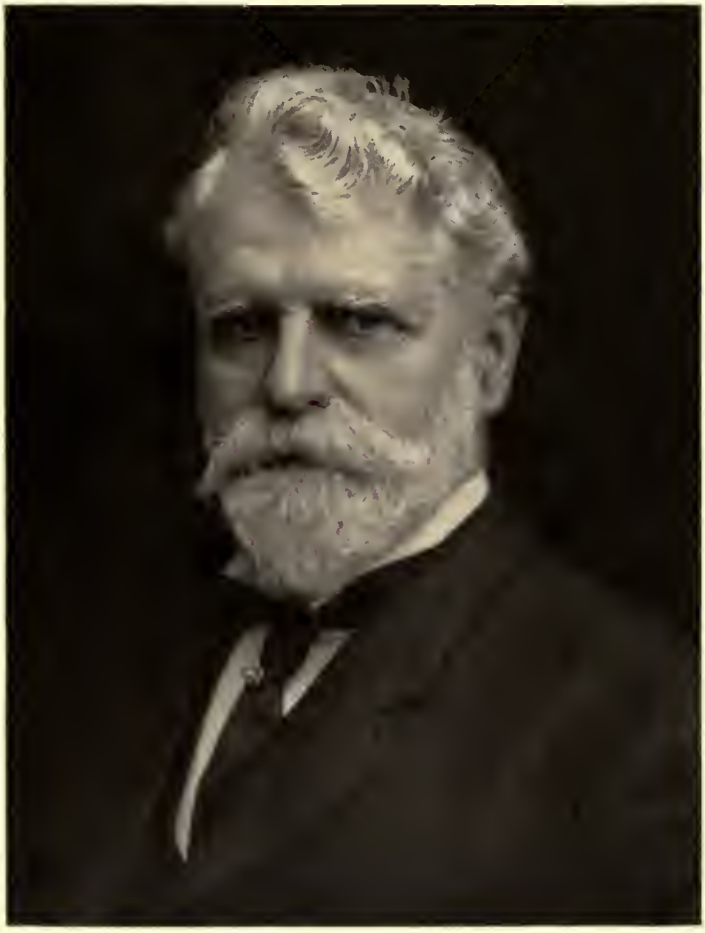
past President and honorary member of the Cleveland Engineering Society and a member of the National Research Council. His connection with foreign engineering and scientific societies includes membership in the Institution of Mechanical Engineers of Great Britain, the British Astronomical Association, and he is a Fellow of the Royal Astronomical Society.

Mr. Swasey has held many positions of trust in the business world. He was President of the Cleveland Chamber of Commerce in 1905, and has always been deeply interested in civic affairs. He served as a member of the Jury of Awards of the Nashville, Pan-American and St. Louis Expositions and as Vice President of the Jury of Award of the Jamestown Exposition.

In 1914, he provided the initial fund which established the Engineering Foundation of the United Engineering Society —the first known instance of a foundation devoted to engineering purposes and intended for promoting the good of mankind through the work of the engineer along the broadest lines.

The PARTNERSHIP

W. R. Warner



Ambrose Swasey

The Partnership

ON May 5, 1880, the two founders established the firm of Warner & Swasey, their initial investment having been their combined savings up to that time. Four young men came with them from Connecticut and formed the nucleus of the new organization. Their first venture was in Chicago, but up to that time few skilled mechanics were found so far distant from the industrial centers of New England, and on that account the business was removed to Cleveland during the following year, the first factory building having been constructed, in 1881, on the site occupied by a portion of the present plant.

Their first order was for ten Hand Lathes, and other orders for different types of machines soon followed until their modest resources were early taxed to the limit. Although more rapid increase in volume of business was perhaps possible, the partners from the beginning determined to adhere to their ideals of workmanship and high standard of product.

Labor-saving machinery formed an important part of their product from the beginning. During the early years machines for milling the cams of sewing machines were designed and constructed, as well as other machines for the manufacture of sewing machines. Vertical milling machines for die sinking and similar work, were also made in considerable quantity. Later a horizontal boring machine was added, and proved to be an important addition.

The Turret Lathe was destined from the beginning to be the principal product of the firm. In due course, the

line of standard Turret Lathes was established by the addition of various sizes and styles, including hand Screw Machines.

Much attention was later given to highly developed brass-working machine tools. The Automatic Boring and Tapping Machine was brought out for simultaneously machining the two ends of globe valves. The introduction of the air brake led to the design and construction of an Automatic Angle Boring and Tapping Machine. About the same time there were brought out the Taper Key Turning Lathe and the Cock Grinding Machine.

The extent to which the design and construction of special purpose machines had been undertaken and the demand for the services of the firm as engineers in this field, made necessary the further specialization in the standard product, and this era was marked by the adaptation of the Turret Lathe to large quantity production of duplicate parts in the bicycle and other industries. Another important development about this time was the introduction of Turret Lathes into the European countries, in unprecedented quantities, until the exports to these countries resulted in further specialization in product and marked increase in production.

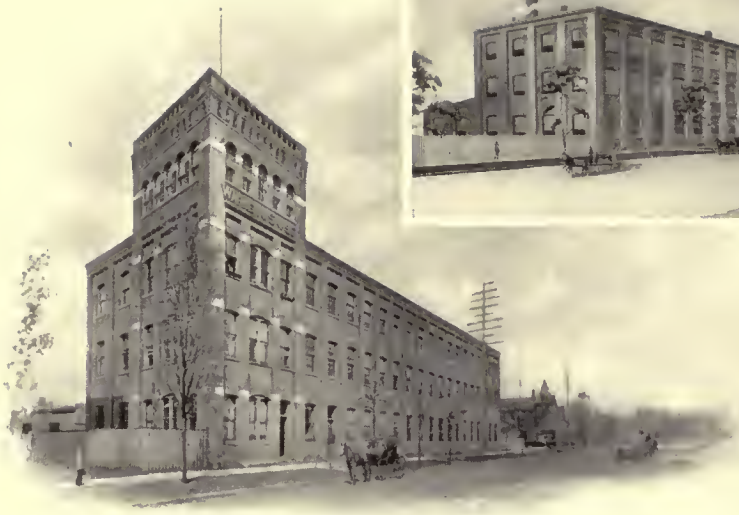
But the business was not destined to be devoted exclusively to Machine Tools. The first telescope to be designed and constructed by the partners was a 9½-inch Equatorial, completed in 1881, this venture having been made possible by available earnings from the early orders for machine tools. The application of the genius and experience of the partners in producing mechanical work of the highest order, combined with their exceptional interest in engineering and science, resulted in marked improvements in the design and construction of telescopes as made up to that time. The success of this first telescope served to create added interest

THE PARTNERS (*seated*) with their Associates who went from Hartford to Chicago in 1880, and the following year to Cleveland

Standing left to right—William S. Lane, George C. Bardons, George D. Phelps and Frank H. Woods

Portion of First Shop in Cleveland, 1881

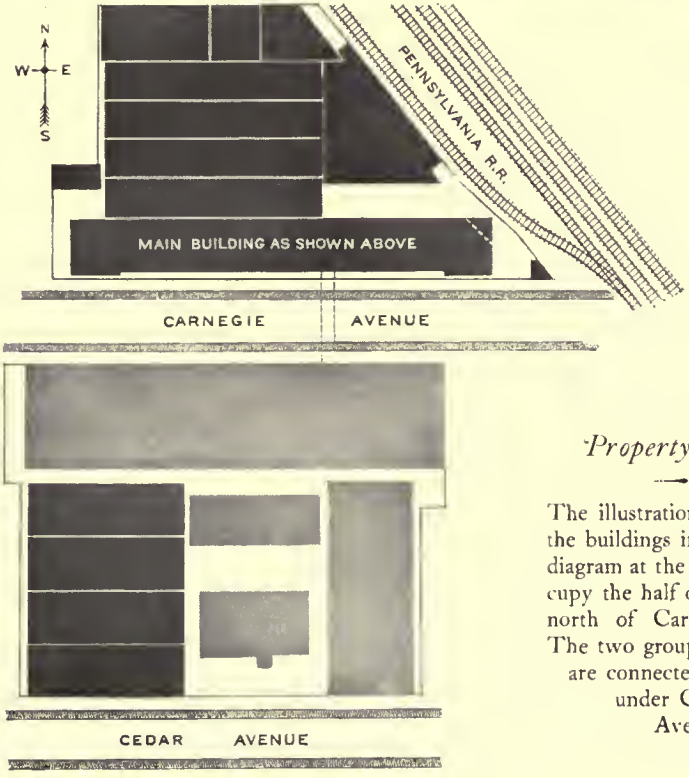
1881



1887

1893

1910



Property in 1920

The illustration above shows the buildings indicated in the diagram at the left, which occupy the half of the property north of Carnegie Avenue. The two groups of buildings are connected by tunnel, under Carnegie Avenue

Walter M. Allen, *Works Manager, 1905-1909*

MR. ALLEN began his apprenticeship in 1885 and early displayed exceptional interest and aptitude in mechanical problems. In recognition of his ability he was given the opportunity to serve a portion of his apprenticeship in the drawing room, where he progressed so rapidly that in 1891 he was appointed head of the department. The higher development of the Machine Tools produced was notable during the period of his administration and he was also closely related to the design and construction of large telescopes. In 1893, when 27 years of age, he was made Superintendent. In 1900, he was elected a Director of the Company; and in 1905, he became Works Manager, which position he filled until his untimely death in 1909.

William E. Reed, *Secretary, 1900-1905*

MR. REED came with the firm in 1892, and was in charge of the office and correspondence. In 1893 he was appointed the firm's representative at the World's Columbian Exposition, Chicago, in charge of the instrument exhibit including the 40-inch Yerkes Telescope. For several years he was in charge of advertising and did much editorial and publicity work. In 1900 he was the representative in charge of both the Machine Tool and Instrument Exhibits at the Paris Exposition. On the incorporation of the business in 1900, Mr. Reed was elected a Director and Secretary, which positions he held until 1905, when ill health caused his partial retirement and his resignation in 1909.

William S. Lane

MR. LANE was one of the four men who at the beginning of the partnership came in 1880 with the principals from Hartford and located in Chicago. For many years he was the head Pattern-maker, and as the business increased he trained and managed the growing force in this department. At the time of the formation of the corporation, he was foreman of the Pattern Shop, which position he held until 1914, when ill health compelled him to give up active work. His death occurred in 1915, while still in the service of the Company.

Gottlieb L. Fecker

MR. FECKER became associated with the firm in 1895, as designer of precision instruments and theoretical optician, and was made Superintendent of the Instrument Department. Among his early contributions of especial note was his work in the perfecting of the 40-inch Automatic Dividing Engine. In addition to his accomplishments in connection with astronomical instruments, he gave much attention to research work and the development of military instruments of precision for the Army and Navy. For his contributions in the design and construction of the instruments exhibited by the company at the great Expositions, Mr. Fecker, as collaborator, received awards. Because of ill health it became necessary for him, in 1916, to retire from active association with the Company.

in that direction, and during the several years following numerous contracts came to them for the construction of other instruments.

The first of these great engines of science which the new firm designed and constructed was the 36-inch Refracting Telescope of the Lick Observatory, Mount Hamilton, California, which was erected during the winter of 1886–1887. This was the largest refracting telescope constructed up to that time, and was the first to be adapted to the triple purposes of visual, photographic and spectroscopic work. This instrument proved so satisfactory that the government commissioned the firm to construct a mounting similar in design for the 26-inch objective of the United States Naval Observatory, Washington, and later they were entrusted with the task of designing and constructing the 40-inch telescope, as well as the 90-foot dome and the 75-foot elevating floor, for the Yerkes Observatory, Williams Bay, Wisconsin. This latter instrument remains the largest refracting telescope yet constructed.

Transits, meridian circles, astronomical and other instruments of extreme accuracy have also held a large place in the firm's work. The design and construction of these types of precision instruments represent the highest order of mechanical and scientific achievement, and involve the perfecting of methods and mechanisms to a degree of refinement almost beyond the range of understanding.

One of the most important of these achievements was the construction of a Dividing Engine for automatically graduating circles of 40 inches or less in diameter, requiring the greatest accuracy, such as are necessary for astronomical and other instruments. The severest tests show that the greatest errors of this engine are less than one second of arc. A second of

arc subtends about one-third of an inch at the distance of one mile. Although the graduations on the inlaid silver band of this machine are so fine that they can scarcely be seen with the naked eye, the width of each line is twelve times the maximum error in the automatic graduations which the machine produces. This machine has proved to be the most accurate in existence.

During the Spanish-American War, in 1898, the firm was asked to undertake the manufacture of military instruments of precision, and it gave considerable attention to the impending needs in that class of equipment. As a result of this service to the Government, many of the military problems in optical instruments, including especially the fire control of guns, were from time to time presented to the firm for solution and subsequently numerous important instruments were designed and manufactured for this purpose.

Some evidence of merit of the Machine Tools and Astronomical Instruments produced during the time of the partnership (1880-1900) may be found in the reproductions in this book of medals and diplomas awarded to the firm for exhibits made at the Paris Exposition, 1889, and the World's Columbian Exposition, Chicago, 1893.

Private Observatory of Messrs. Warner & Swasey

The CORPORATION

IN 1900, the business which for twenty years had been conducted as a partnership, was incorporated under the name of The Warner & Swasey Company. This change was desirable on account of the growth of the business and to better provide for a larger organization and further expansion in facilities.

Before this time the product of the firm had been thoroughly established in a standardized line of Machine Tools and also as designers and constructors of Astronomical Instruments. While the latter proved to be a highly important adjunct with respect to the character of work involved, yet in relative importance in volume of business, it was only incidental.

Recognizing early the new era in industrial development and the relationship of modern machine tools to the growth of industry, plans were made soon after the time of incorporation for the complete reconstruction of the plant, which was not only greatly enlarged, but completely modernized, as was also the equipment.

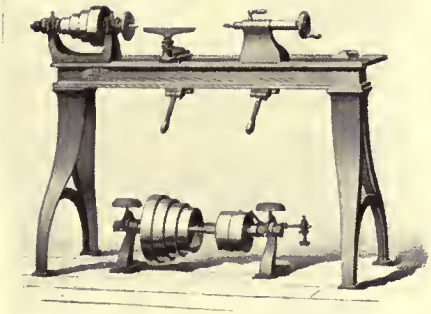
The Hollow Hexagon Turret Lathe was first introduced in 1900, following a period of thorough development. This type of machine represented greatly advanced practice, and was designed and constructed with special reference to the maximum production of which the new high-speed tool steels were capable. The Hollow Hexagon turret, an original and perhaps the most characteristic feature of the machine, together with other new features, served at once to establish the machine in a distinctive place.

In 1911, the Universal Hollow Hexagon Turret Lathe was brought out, embodying an independent cross and longitudinal carriage for simultaneous operation with the turret, and adapting the machine to a wide range of both bar and chucking work. New production standards were again established generally, by these improvements introduced in advance of the practice of the most progressive users of machine tools.

Improved designs of the plain types of Turret Lathes kept these machines in increasing demand for large quantity production of the simpler classes of work requiring single purpose machines equipped with highly specialized tool equipments, and also for small lot production with general tooling.

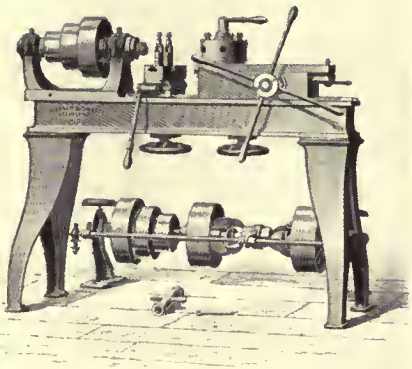
To better serve our customers and in order to meet the rapidly changing conditions as related to machine tools, the new organization, following the incorporation of the company, included most comprehensive sales plans. Accordingly, during the last score of years the Sales Organization was established and constantly increased, including branch offices in the leading industrial centers of the country. At the same time much attention has been given to the sale of machine tools in foreign countries until the export business of the company has been extended to all the principal countries of the world.

The earlier achievements in producing telescopes and other instruments were augmented by numerous important contracts. The most notable among these achievements were the further development of military instruments for the Government and the design and construction of the 72-inch Reflecting Telescope for the Dominion Astrophysical Observatory of Canada.



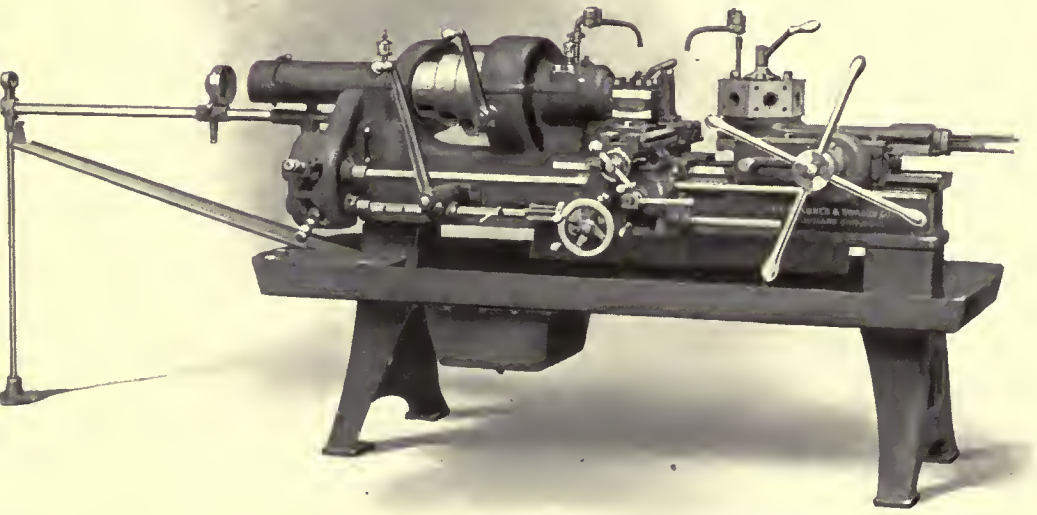
12 INCH HAND LATHE.

1880

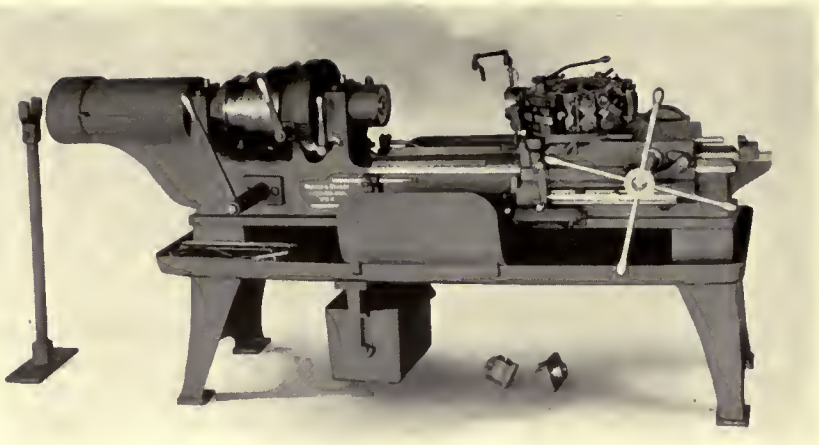


16 INCH MONITOR LATHE.

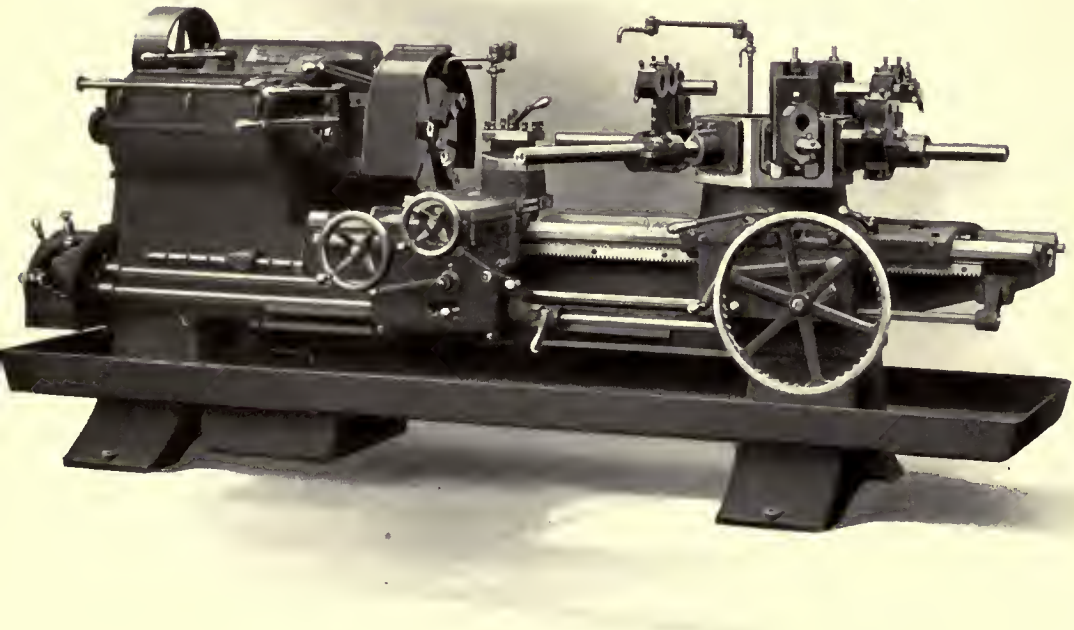
1881



1920. No. 4 Universal Turret Lathe

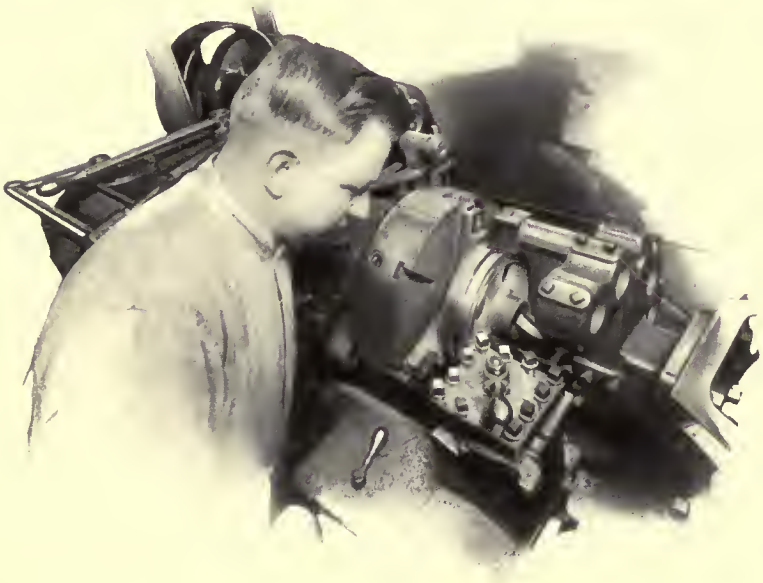


1900. Hollow Hexagon Turret Lathe

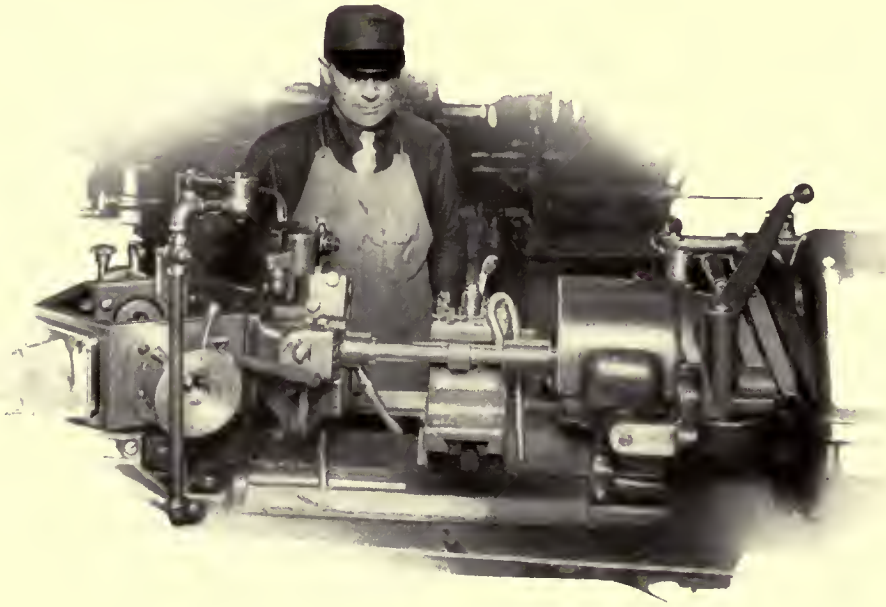


1920. No. 3A Universal Hollow Hexagon Turret Lathe

One of the Main Assembling Departments



One of the Departments in the Plant



Early in the last decade, in continuation of the work undertaken for the Army and the Navy following the Spanish-American war, additional instruments were designed and manufactured, including Range Finders, Gun Sight Telescopes, Azimuth Instruments, Field Telescopes, Telescopic Musket Sights, Prism Binoculars, and so forth.

The contract for the 72-inch Reflecting Telescope was undertaken in 1913 and the instrument completed and installed three years later. This great instrument weighs 55 tons, has a tube 30 feet long and 7 feet 4 inches in diameter, and is specially adapted to astrophysical research, including spectroscopic, photographic and visual work. In size, this telescope is exceeded only by one other yet constructed.

Among other important instrument projects may be mentioned the 60-inch Reflecting Telescope, now being designed for the Observatorio Astronomico de la Nacion Argentina. Upon completion and installation of this instrument, it will be the largest telescope in South America, and one of the four largest reflectors in the world.

Awards received during this period (1900-1920) on exhibits of Machine Tools and Astronomical Instruments, included the Paris Exposition, 1900; Pan-American Exposition, Buffalo, 1901; Universal Exposition, St. Louis, 1904, and the Panama-Pacific International Exposition, San Francisco, 1915.

The Warner & Swasey Course in Mechanical Training as now constituted represents twoscore years of development. Nearly forty years ago Mr. Warner and Mr. Swasey began to train apprentices. The early apprentice course has been greatly extended, including every class of skilled machine shop work. A supervisor of apprentices supplements the instruction customarily given in shop methods, thus making the practical training most thorough. In addition, the company,

in 1911, established in the factory, under the direction of a technical instructor, an Apprentice School for the purpose of augmenting the practical training by the study of drafting, mathematics, mechanics, materials and other related subjects needed for the highest development of an apprentice.

Many important positions in the Company are now held by graduate apprentices, including the Works Engineer, Superintendent, Assistant Superintendent, Production Engigineer, Foreman of Drafting Room, Employment Manager, and District Sales Manager, together with many Foremen, Inspectors and others. Still other graduate apprentices have gone to important positions elsewhere, or established themselves in business, with commendable success.

The training of men has been regarded as even of greater importance than the development of the product and the plant. This training has not only included mechanics, but also engineers, sales representatives, as well as nearly all of the higher executives in the organization.

In 1909, Mr. Frank A. Scott became associated in the business as Secretary and Treasurer, and at the same time was made a Director of the Company. In 1916, he was elected Vice President and now occupies that position. In addition to his qualities of leadership, he brought into the organization his extensive experience as Secretary of the Cleveland Chamber of Commerce and later as Secretary and Treasurer and Vice President of the Superior Savings & Trust Company, Cleveland, and also subsequently as Receiver of the Municipal Traction Company, Cleveland.

Reference to the service of the company during the European war period will be found on following pages of this book, under the heading of "War Record" and of the military service of its employees, under the heading of "Honor Roll."

DISTINGUISHED *for* LONG SERVICE

THIS book would be incomplete without an acknowledgment of appreciation to employees distinguished for long service, and it is a happy privilege to record in this anniversary publication the names of the men and women who, by their service of more than a decade, have merited this distinction. Each by his ability and loyalty has contributed to the up-building of the organization.

Here are found the names of those whose abilities have made them foremen and executives and also those who preferred the lesser prominence, but equal importance of loyal application to their respective duties. Each justly may take pride in the leadership he exercises. Efficient service and long service have combined to make these men and women exemplary members of the organization of which they are a part.

Favorable mention should also be made of the large number of employees who have been in the service for lesser periods of time, who have contributed largely to the development of the organization. The company is profoundly interested in the part which it has had in the preparation of any of its employees for places of greater usefulness.

We hope and believe that the organization which celebrates with us the fortieth anniversary of the founding of the business is based on that spirit of increasing and faithful service to the world, which has become more than ever the great need of mankind.

Distinguished for Long Service

Thirty-five to Forty Years

George A. Decker

Thirty to Thirty-five Years

Fred J. Prindle

Twenty-five to Thirty Years

Rudolf Bourziel
George W. Drake
John H. Fathauer
Adam Herkner
Michael T. McCormick

Twenty to Twenty-five Years

August Becker
William J. Burger
Edward P. Burrell
Robert G. Buyer
B. Frank Castle
Frank H. Casterline
Gottlieb L. Fecker
John T. Fry
Peter J. Herkner
John Kessler
Frank Kuchenbrod
John E. Kunze
Walter E. Marshall
Joseph M. Ryan
Peter J. Seiberth
Leslie B. Stauffer
Otto Volz
William Warnock
Harry E. Witham

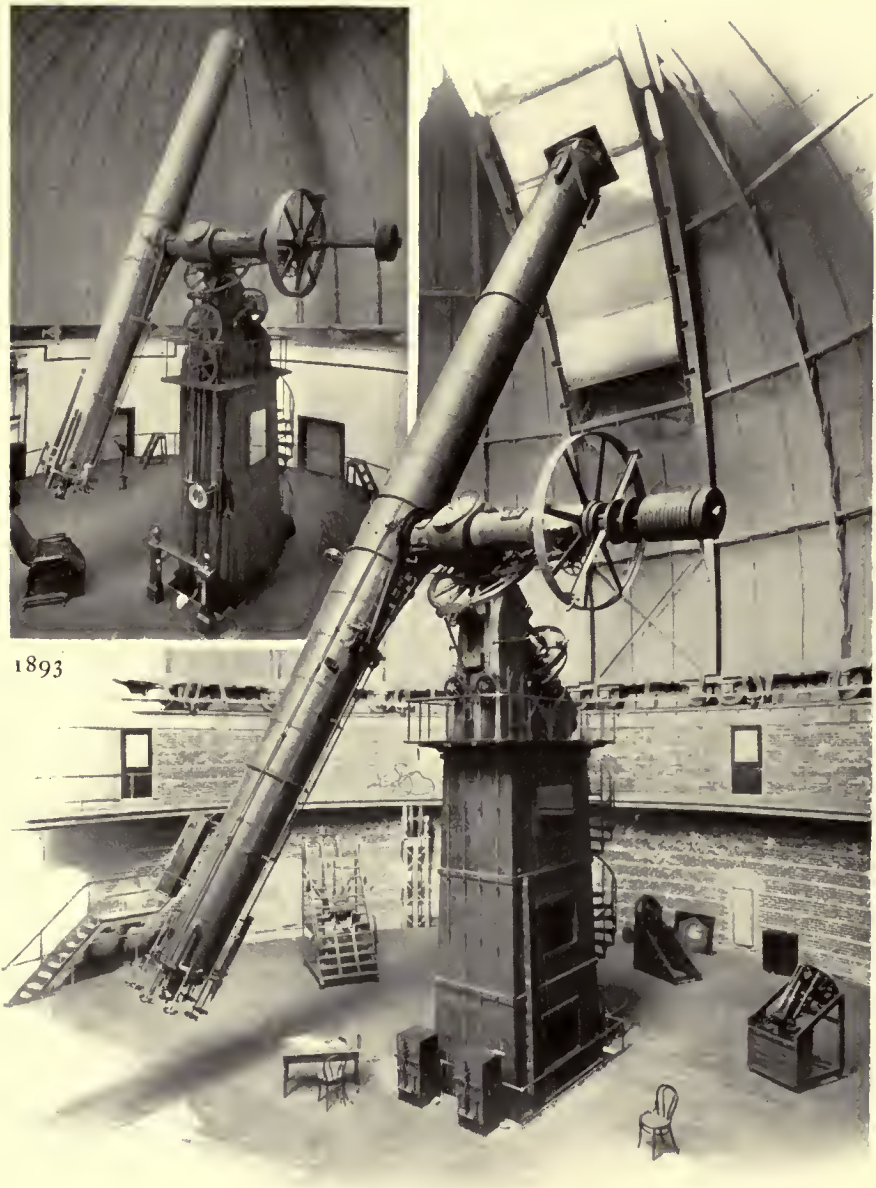
Fifteen to Twenty Years

Miss C. J. Baker
Carl F. Beutel
Claude J. Cahill
Albert C. Cook
Hal L. Cook
Martin J. Deak
Valentine Geldon
Louis Hackbert
William F. Harbath
Anton Heil
Joseph M. Hlavin
Harry T. Hughes
Henry L. Kinsley
Joseph Kral
William Krumeri
John F. Kuhlman
Charles W. Luther
Thomas F. McCauley
John J. Meyer
Emil R. Nau
George B. Pearson
Joseph Ringenbach
Otto H. Seifert
Stephen Skorvanek
Joseph Stiegerwald
Harry Suit
Mike Wargo
George Young

Ten to Fifteen Years

Edward W. Addis
Charles H. Baush
Lawrence K. Berry
Otto W. Birhanzl
Herman Bisler
George V. Black
Frank A. Blaha
Philip E. Bliss
Cornelius Boehnlein
Miss A. I. Bradley
Charles W. Brandt
Eugene Buettner
John J. Carrick
Edgar R. Carney
Andrew P. Curry
Henry J. Dengler
Louis C. Dwors
William N. Early
Thomas Edwards
Augu t Flaum
John A. Graff
Edward W. Gressle
Donald M. Gurney
Lester R. Hawkins
Herbert T. Hayes
Albert Hoehn
William A. Hunt
Bennet T. Jones
Gustav Juhnke
Frederick J. Kachel
Stephen Kirschner
Emil R. Klick
John E. Kramer
Clarence H. Kress
Charles Krumrei
Stephen Lawson
Robert F. McCullough
Miss D. S. McElroy
Joseph Mazur
Charles A. Miller
Louis Miller
Evan J. Neilsen
Carl E. Neubert
George Noeth
Conrad Nuhn
Charles H. Owen
Albert C. Reichert
George P. Ritter
Lawrence Schmitz
Frank A. Scott
John Sedio
John Soeder
Frank Spac
Joe Spitznagel
August Splittorf
James A. Sprague
Peter W. Stein
Charles J. Stilwell
Berger Swanson
Nels Swenson
William A. Tansler
James S. Trhlin
August Vandrake
Charles Vosmik
William J. Woodruff
George Ziegler

Insert shows the first Telescope (9½-inch) made by Warner & Swasey
Below—The 36-inch Lick Telescope, the largest Refracting Telescope in the world at the time of its completion, in 1886



1893

1894

Insert—26-inch Telescope, United States Naval Observatory, Washington, D.C.
Below—40-inch Yerkes Telescope, the largest Refracting Telescope yet constructed.

1916

72-inch Reflecting Telescope for the Dominion Astrophysical Observatory of Canada. This great instrument weighs 55 tons, has a tube 30 feet long and 7 feet 4 inches in diameter, and is provided with a mirror 72 inches in diameter.

Below—A reproduction of a model of the 72-inch Reflecting Telescope, 66-foot Revolving Dome and Observing Bridge.

The Warner & Swasey 40-inch Automatic Dividing Engine

The severest tests show that the greatest error of this Dividing Engine is less than one second of arc. A second of arc subtends about one-third of an inch at a distance of one mile. Although the graduations on the inlaid silver band of this machine are so fine that they can scarcely be seen with the naked eye, the width of each line is twelve times the maximum error in the automatic graduations which the machine produces. This machine has proved to be the most accurate in existence

The Present

By Frank A. Scott, *Vice President*

"The past at least is secure."

THE achievements of twoscore years have passed into history. The structure created by forty years of effort; the character which an organization develops from the nature of its directing forces; the standing of a name in trade and industry, and in the world of finance, which represents the total of both character and performance, must be upheld and carried on by men too young to have done more than contribute to that for which they must become responsible.

Will this organization be able to maintain the high standards now established; will it be able to build still higher the dignified structure already created; will it be found to have within itself the power of continuous development; will its services be worthy of the name it bears?

To answer these questions in the negative would be to reflect at once upon those who now compose the organization and upon the men who are responsible for its existence. To have created a business, sustained by a group of trained industrialists, and not to have provided within it that power which would make it self-perpetuating, would not have evidenced either wisdom or capacity. Fortunately, the entire history of the forty years we now celebrate testifies to recognition of the need for developing men. The apprentice school has supplied the renewals needed within the body that has supported it, and has made liberal

contributions of trained and talented men to the metal working industry generally.

The sales organization has grown outward from the parent body, until now it ramifies into every State in the Union and Canada; into England and Europe, South America, Australia, China, India, Japan; indeed into the four corners of the earth.

The personnel of our official staff is made up almost entirely of men who have developed, within the organization, from humble positions, to the offices which they now fill.

Machine tool makers are practical men—if they dream, such dreams must take form in drawings, wood and metal before the world can recognize value in them. Nevertheless, even a dreamer would hardly have dared to predict what the present generation of machine tool workers has seen come true within the years spanned by its own experience. The history of mechanical progress within the twoscore years covered by the life of this organization is so marvellous as to test credulity.

As the increasing use of iron and steel in the past necessitated more efficient machine tools, so will the need of the future be for machines to perform work which may now seem impossible. We are at the threshold of an era of bigger things in metal working.

From the years when wood was a generally used and acceptable material for many purposes, when metal was required but rarely, compared to its uses today, this business has come into a period which the future will recognize as distinctly a metal age. The machines originally designed were for use on brass, cast iron or a steel of known character, limited in the degree of its possible variability. Today,

the uses of these machines have been expanded in proportion to the world development of forty years. Brass is still one of those materials commonly worked on; cast iron also, but added to the list we find steel forgings, aluminum, hard rubber, ebonite; the steels of the days of old and alloys of infinite variety.

If we are at times inclined to feel the commonplace in our calling, let us remember that these changes in the mechanical arts, which our business had helped to make possible, represent the steady onward march of the human race toward a broader and happier existence. Let us remember that the sometimes hard and prosaic tasks of our daily lives are all woven into this great romance of human progress; and, immediately, we recognize the dignity of labor and the glory of practical achievement. The machine tool then becomes one of the instruments contributing to human welfare, without which the peoples of the earth would perhaps still have been 'way back on the road, lumbering along in ox-carts with solid wooden wheels.

Added to this, we enjoy the peculiar satisfaction of knowing that not only the mechanical world, but the scientific world also, has received contributions from the genius and efforts of this group of workers. The knowledge of the universe which mankind possesses has been increased by our efforts, for nightly, the eyes of earnest men in many lands search the skies through instruments that are the product of this plant and this organization, and report their discoveries to all men.

We find, within this organization, inventive brains to design and develop a product that keeps pace with the advance in mechanical arts; skilled hands to work out that product; trained minds and aggressive spirits to present

it to the industrial world; financial men to study and direct the economics of the business and administrators to co-ordinate these activities and to formulate policies which shall govern all.

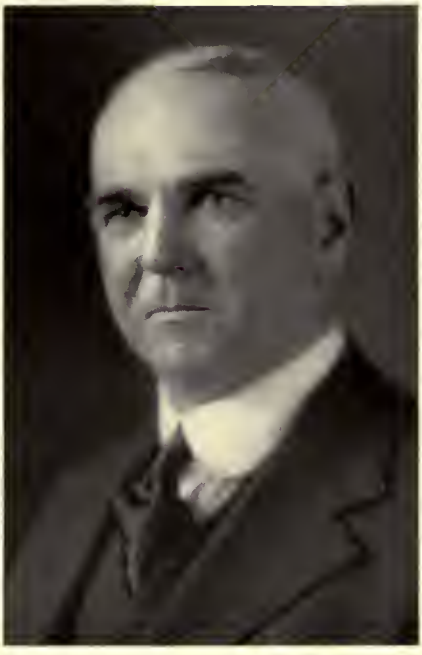
All this, to endure, must rest on character; on honest endeavor in each of these fields; on a sincere purpose to serve worthily; on acceptance of the belief that to have purpose and to serve means to live, and to be without purpose means to die.

"The Present," to me encompasses all these and many other things unexpressed. My confidence is serene that the men and women who now make up what we call "the organization" feel and believe all these things; that when another forty years shall have rolled around, the young men and women of that day will be as proud of eighty years of WARNER & SWASEY history as we are today of forty, and will be viewing their future steady-eyed and as ready as are we, "to greet the unknown with a cheer."

F. A. Scott

L. B. Stauffer, *Secretary*

P. E. Bliss, *Treasurer*



E. P. Burrell, *Works Manager*

A Conference of Officers and Department Heads

George A. Decker
Works Engineer

Adam Herkner, *Superintendent*

Fred J. Prindle, *Engineering Dept.*

Twenty-five Years and Upwards in the Service of the Company

George W. Drake

Michael T. McCormick

John H. Fathauer

Rudolph Bourziel

Graduate Apprentices in the employ of the Company

The ORGANIZATION

L. B. STAUFFER, *Secretary*

L. B. Stauffer entered the employ of the company in 1896, as a general assistant in correspondence and accounting. In 1900, he became the chief office executive, including charge of the correspondence for both the Machine Tool and Instrument Departments. His responsibilities subsequently included also the Advertising, Credit and Purchasing Departments. For more than twenty years he has been directly and continuously associated with the principals of the company in the administration of the business. In 1914, he was made Assistant Secretary of the company. In 1915, he became a Director, and in the following year was elected Secretary, which position he now occupies.

P. E. BLISS, *Treasurer*

P. E. Bliss entered the company's employ in 1910 as a clerk in the Accounting Department. Two years later he was appointed Cashier, and in 1915 was made Auditor. In this capacity he made a special study of matters pertaining to taxes of all kinds, and is a recognized authority on such questions. In addition to his financial duties, he has been associated in problems of organization. He was elected Treasurer of the company in 1918, and the following year became a Director, both of which positions he now holds.

E. P. BURRELL, *Works Manager*

E. P. Burrell came with the company in 1900, in the capacity of Technical Engineer (Cornell M. E.—E. E., M. M. E.). Later he was engineer in charge of buildings, including plant arrangement, and subsequently supervising engineer in charge of the erection of the present plant. He was also associated in the design of smaller telescopes and more recently was in charge of designing and constructing the 72-inch Reflecting Telescope, for the Dominion

Observatory of Canada. During the European war period he was prominently associated in the design and production of military instruments of precision. His principal work has included the engineering and technical problems relating to the design and construction of Machine Tools. In 1909, he became Works Manager, and in 1915 was made a Director of the Company, which positions he now holds.

A. C. Cook, *General Sales Manager*

A. C. Cook began as clerk in the Order Department, in 1901. He became assistant to the Sales Manager in 1905, and two years later was sent to the New York Office as assistant to the manager of that territory. He was made Manager of the New York Office in 1911, and the following year went to Europe, where he spent two years as the Manager of European Sales and in the study of European machine tool markets. Returning in 1914, he was made Sales Manager, and the latter part of the same year made another trip to Europe, remaining until 1915. In 1919, he made another tour of Europe to study the conditions in those countries immediately following the war. As Sales Manager he took a leading part in developing the volume of sales both in domestic and foreign markets. In recognition of the service rendered, he was made General Sales Manager, in 1919.

L. K. Berry, *Domestic Sales Manager*

L. K. Berry came to the company as an office boy in 1904, and was promoted the following year to the Order Department, where he served successively as billing clerk, order clerk and correspondent. From there he was transferred to the Sales Department, where in 1906 he became Assistant to the Sales Manager. After an absence of two years, he returned in 1910 as Sales Representative in Ohio. He became Manager of the New York Office in 1914, returning to the Cleveland Office two years later, and was made Assistant Sales Manager in 1917. He became Domestic Sales Manager in 1919, which position he now holds.

C. J. Stilwell, *Foreign Sales Manager*

C. J. Stilwell began in the shop as a special apprentice in 1910. After completion of this course, he was transferred to the office, where he worked in the Order and Sales Departments. In 1912, he became the Manager of the New York Office. He was sent to Europe in 1914. Returning to this country, he was made Assistant to the Vice President in 1916. During the war period he was engaged in the negotiations with and follow-up of other manufacturers associated as sub-contractors in the company's war contracts. In 1919, he was appointed Foreign Sales Manager, in which capacity he has just completed a second European investigation.

G. A. Decker, *Works Engineer*

G. A. Decker was among the first apprentices, having begun service in 1882. Early in his career he won distinction by being appointed Foreman of an important department before the completion of his apprenticeship. Subsequently he served as Foreman until 1895, when he became Assistant Superintendent. He visited Europe in 1900, and for many years has been associated in the designing of Machine Tools. During the construction of the great telescopes, he gave much attention to this work and was in charge of the installation of some of the largest instruments. In 1905 he became Superintendent and was made Works Engineer in 1913, which position he now holds.

Adam Herkner, *Superintendent*

Adam Herkner began as an apprentice in 1892, and, on becoming a journeyman, he worked in the Lathe Department. He left the employ of the company for a time, returning in about two years. In 1900, he was made Foreman of the Tool Room, giving special attention to making tools, jigs and fixtures. He became Assistant Superintendent in 1909, in charge of machining methods and production problems. In 1913, he was advanced to the position of Superintendent, in which capacity he still serves.

P. J. Herkner, *Assistant Superintendent*

P. J. Herkner entered the service as an apprentice in 1898. Upon becoming a journeyman he worked in the Tool Room. After an absence of less than a year he returned as tool maker in 1903. Two years later he was given charge of the unit assembly work, going from there to the Drilling Department, where he was made Foreman. In 1909, he was placed in charge of the Tool Room and remained its Foreman until 1916, when he was appointed Assistant Superintendent.

W. J. Burger, *Production Engineer*

W. J. Burger began his apprenticeship in 1899, and, after its completion, progressed successively to positions of increasing responsibility until he became Chief Inspector, Demonstrator, and subsequently head of the Sales Engineering Department. In this latter capacity he specialized in the design of small tools and rapid production methods, and also made exhaustive studies and original research in metals, inaugurating in the factory an advanced system of metallurgy. In 1915, he began important improvements in production methods and the introduction of the Bonus System. During 1917 and 1918 he devoted much time to devising equipment and supervising the manufacture of military instruments of precision. In 1918, he became Assistant Superintendent, and in 1920, was made Production Engineer.

Stephen Lawson, *Foreman of Designing Department*

Stephen Lawson began his apprenticeship in 1904. The latter part of his time was served in the Drafting Room, and on completion of his apprenticeship he assumed advanced duties in that department. In 1910, he was made Foreman of the Designing Department, in which position he is a leading associate in the design of Machine Tools and related engineering work. In addition to his other duties, he was, in 1920, made Chief Sales Engineer.

War Record

IN modern warfare, machinery is second in importance only to men. The Warner & Swasey Company contributed both. For two and a half years before the United States entered the war, this plant poured out a constant stream of machine tools and instruments for use in munitions factories or on the battlefields of Europe. When our country became a belligerent, this organization, as is shown elsewhere in this volume, gave of its personnel in equally generous measure. Four of the brave men who went forth from this plant to the conflict gave their lives for their country.

Within a few weeks after the beginning of the war, machine tools were generally recognized as one of the limiting factors in war preparations, since the production of munitions was restricted by the available equipment of machine tools. This crucial condition resulted in the necessity for increasing the manufacture of machine tools to correspond with the unprecedented war demand. The turret lathes made by this company were used for the manufacture of gun parts, rifle parts, pistol parts, fuses, shells, hand grenades, cartridges, gas containers, gas masks and many hundreds of similar parts. They were used by the original plant constructing tanks; and by practically every American maker of Liberty motors or other airplane motors, as well as by practically every Arsenal and Navy Yard. Large quantities of machines were supplied to the important munitions plants in England, France, Italy and Russia, particularly during the first two years of the war.

During the first two years of the war, the Company, in addition to its production of turret machines, supplied the Allies with a considerable quantity of binoculars and telescopic musket sights. After our country entered the war, the demand for machine tools was so much greater that, in the opinion of the officers of the Company, it was desirable both from the standpoint of machine tool production and the Company's interests, that the entire plant and organization be devoted to turret lathe manufacture.

Early in the summer of 1917, however, both the War and Navy Departments decided that the instrument section of the plant must be devoted to the production of military instruments. The three instruments which the Government desired from this plant were Naval Gun Sights, Telescopic Musket Sights and Panoramic Sights. Of these, the one most important, as well as most difficult of manufacture, was the Panoramic Sight. This instrument is used for the direction of field artillery fire, and, during the period of the greatest stress, was placed first in priority of all fire-control instruments required for both the Army and Navy. Prior to the war, the sight had been produced only in small quantities and the output was greatly restricted on account of the very difficult problems involved in its manufacture. In fact, large quantity production of the sight, corresponding to the production of field guns and other equipments, was considered impracticable. Here, again, the use of fine turret lathes and tooling equipments provided by The Warner & Swasey Company were in marked evidence. In addition, however, the Company had the advantage of its experience in the design and construction of instruments of precision, which made possible the most complete equipment of special machinery, tools, fixtures, etc. Briefly, the result was the

production of the Panoramic Sight in a manner and on a scale so satisfactory as to receive from our Government the Certificate of Merit shown below.

This was accompanied by the following citation by the Chief of Ordnance, as follows:

"For exceptionally rapid development of manufacturing methods and quantity production on a vast scale of Panoramic Sights"

THE WAR DEPARTMENT OF
THE UNITED STATES OF AMERICA
RECOGNIZES IN THIS AWARD FOR DISTINGUISHED SERVICE
THE LOYALTY ENERGY AND EFFICIENCY IN THE PERFORMANCE
OF THE WAR WORK BY WHICH
The Warner & Swasey Company
AIDED MATERIALLY IN OBTAINING VICTORY FOR THE ARMS
OF THE UNITED STATES OF AMERICA IN THE WAR WITH
THE IMPERIAL GERMAN GOVERNMENT AND THE IMPERIAL
AND ROYAL AUSTRO-HUNGARIAN GOVERNMENT

Secretary of War

Assistant Secretary of War
Director of Munitions

FRANK A. SCOTT

In March, 1917, Secretary of War Baker, Chairman of the Council of National Defense, appointed Mr. Scott to the chairmanship of the Munitions Standards Board, Council of National Defense. On March 31st, the Council called him to the additional post of Chairman of the General Munitions Board, a co-ordinating body of army and navy officers of high rank and of representative business men, working in co-operation with the War and Navy Departments.

The effective assistance rendered by this Board in the early months of our participation in the war, is generally recognized. Without its expert aid in locating and creating new sources of supply and production, and in promoting co-ordination between the several governmental departments, as well as between American manufacturers and government, the United States would have been delayed indefinitely in constructing cantonments, and in placing the masses of contracts for the vitally essential small arms, artillery, ammunition and equipments.

The work and effectiveness of the General Munitions Board made evident the opportunity for a larger body, with still greater powers; and this need was met by President Wilson in August, 1917, when he created the War Industries Board. Mr. Scott was appointed to the chairmanship of this Board, and the work of the General Munitions Board was merged with the broader duties of the new body.

The Distinguished Service Medal was awarded to him in June, 1919, by the President, with the citation:

> "For exceptionally meritorious and conspicuous services in assisting and organizing and as Chairman of the Munitions Standards Board and The General Munitions Board. He was later first Chairman of the War Industries Board. He thus contributed greatly in developing the War Department's programs."

Honor Roll

Men of The Warner & Swasey Company Organization Who Entered War Service 1917—1918

NAME	ORGANIZATION
J. Abbott	*Infantry*
A. Abraham,	*314 Amm. Train, A. E. F.*
Louis Adamski	*Polish Army*
W. Albanowski,	*Prov. Battalion, M. P.*
D. G. Allen	
Arthur Alsterburg	*Infantry*
Joe Angelo	*Infantry*
J. Anovsky	*Infantry*
L. Arata	
John Archibald	*Infantry*
Joe Arman	
Amos Aspery	
J. Bahara,	*384th Infantry, 96th Division*
W. K. Bailey	*U. S. Navy*
W. Baird	*Signal Corps*
Wm. Balacek	*U. S. Navy*
D. J. Baster	
William Becka	*Quartermaster Corps*
Ralph H. Behrend	*Infantry*
F. Bennig	*Infantry*
Norman Betz	*4th Infantry*
Raymond Betzmer	*U. S. Navy*
A. Biando	*28th Infantry*
	Fourragere
A. Biscotti	
J. J. Bittner	*59th Infantry*
	Citation
Frank A. Blaha	*Infantry*
William Blake	*Motor Transport Corps*
Alex. Boehnlein	
A. Bolt	*Infantry*
I. C. Bolton,	*Capt., 135th F. A., A. E. F.*
G. Bompessutto,	*2nd Corps, School Det.*
R. Boynton	*Infantry*
W. A. Branscome	*Infantry*
Earl Brasse	*Infantry*
Steve Brbak	*Infantry*
Joseph Breitman	*Infantry*
P. Brossek	*Infantry*
W. Brunner	*Infantry*
N. Burmeister	*Quartermaster Corps*
T. H. Bushnell, Jr.	*Naval Reserve*
Ignazio Calcavecchio	*Italian Army*
Joe Calcavecchio	*Italian Army*
L. Camillieri	*Infantry*
T. Campbell	*Tank Corps*
Dan Carol	*Infantry*
Chas. Caronita,	*1st U. S. Eng., A. E. F.*
L. Cassegrande,	*R. U., 28th Div., A. E. F.*
Howard Casterline	
Chas. Cerni	*Infantry*
C. Cilinti	*Infantry*
Spencer Coleman	*Engineers*
Frank Conday	
E. Crane	*Infantry*
Walter Crease	*U. S. Navy*
G. Crumley,	*331st Infantry, A. E. F.*
H. Daedelow,	*332nd Infantry, A. E. F.*
	Medaille de Valeur
C. R. Davis	*Quartermaster Corps*
F. E. Davison	
Dwight L. Deckert,	*135th F. A., A. E. F.* ★
	Killed in Action

NAME	ORGANIZATION
J. Dersky	*U. S. Navy*
F. Diantonio	*Infantry*
J. Difrisco	*Infantry*
H. Downey	*Infantry*
Evan A. Downs	
J. Dura	
Curtis W. Ebersole	
H. Ebersole	*Infantry*
John Eisner	*U. S. Navy*
Duey Ellsworth,	*135th F. A., A. E. F.*
L. Elsasser	
Fred Endris	
John Eneye	
Donald Fabel	
Joseph Fal	*U. S. Navy*
Arthur H. Feger	*Air Service*
W. Fenwick	*Marine Corps*
John Ferlito	*157th Depot Brigade*
J. Ferro	*Infantry*
★C. F. Fleischer,	*61st Infantry, A. E. F.*
	Killed in Action
A. Frecapone	*Infantry*
A. Furling	*Infantry*
Scott Gillmore,	*1st Lieutenant, Ordnance*
A. Goss	*Signal Corps*
L. K. Goss,	*1st Lieutenant, Ordnance*
J. Gotthart	*Infantry*
J. Gross,	*127th Battalion, M. P. Corps*
A. Grunau	*First Air Service*
J. Grysban	*49th Artillery, C. A. C.*
E. W. Guentzler	
J. Gurrera	*Quartermaster Corps*
C. Gurstack	*U. S. Navy*
Wm. Hamill	
Paul Hanak	*Infantry*
R. Hansen	*Naval Militia*
S. Hanula	*Infantry*
E. Harmon	
Andrew Harris	*U. S. Navy*
A. Heinmiller,	*S. A. T. C., Carnegie Tech.*
A. Heitepriem	
John Hennig	

NAME	ORGANIZATION
Edward C. Higbee, 2d.,	*1st Lieut., C. A.*
Wm. Higgins	*U. S. Navy*
John Hoderski	*Infantry*
W. Hoover	
Richard Horner	*Medical Corps*
L. Hosford	*Infantry*
Nathan Hovivian	*Infantry*
G. Howell	
H. Hoyle	*Engineers*
Dan M. Hoyt	*U. S. Navy*
James Hyland,	*3rd Inf. Replacement Reg.*
F. Jakala	*Air Service*
J. Janett	*Infantry*
Joseph Janovsky	
L. Jarvis	*U. S. Navy*
H. Jeffery	*159th Depot Brigade*
J. Jensen	
C. Jesser,	*3rd Border, Canadian Ambulance*
A. L. Johnson	*Infantry*
Wm. K. Johnson	
Harold Jones	
F. Kagy,	*417th Telegraph Bn., A. E. F.*
Z. Kaminski	
J. Kelo	*Polish Volunteers*
F. E. Keyes	*Marines*
H. M. Killinger	
Hall Kirkham	*Naval Reserve*
J. Klenar	
Benjamin Knox	*Artillery*
Joseph Kokoruda	
J. Komer	*U. S. Navy*
L. Kooacka	
A. Kostesin	
J. Kowalski	
C. Krejci	
Robert F. Krejci,	*Tank Corps, A. E. F.*
J. Kubes	*Infantry*
Mauro Laforgia	
A. F. Landefeld	*Officers Reserve*
J. Laporta	*Infantry*
V. Larsen	*Infantry*
C. Lasker	

NAME	ORGANIZATION
Paul Lazlo	*U. S. Navy*
F. Leisinger	
F. E. Lewis	*Marine Corps*
P. Lewsza	*Infantry*
R. Liborio	*58th Infantry*
E. Lofman	*Infantry*
L. H. Lorenz	*Infantry*
Ed. Luck	*Infantry*
Charles Luft	*U. S. Navy*
V. Lupica	*Infantry, 95th Division*
M. J. Luther, *1st Lieutenant,*	*Ordnance*
J. McCaslin	*Officers Reserve*
I. C. McClain	*U. S. Navy*
M. Mansour	
A. Marek	
Mike Marek	
D. Marondo	*U. S. Navy*
Otto Marshik	*U. S. Navy*
Joe Matwicki	
E. Meding	*Infantry*
W. Meinke, *4th Train B., 158 Depot Brig.*	
H. W. Ments	
R. Meon	
W. Merifield	
W. Michalcsyk	
N. Michael, *147th Inf., 37th Div., A. E. F.*	
O. H. Milestone	*Air Service*
Alexander Miller	
C. Miller, *324th M. G. B., 83d Div., A. E. F.*	
Edward Miller,	*Motor Transport Corps*
J. Milner	
H. Mitchell	
J. Moczoroski	
F. Moore	*U. S. Navy*
L. L. Moorman	
B. Morefield	
W. Morefield	
E. Mosman	
J. F. Movens	
J. Myslik, *331st Infantry Band, A. E. F.*	
W. Neat	
M. Nehes	

NAME	ORGANIZATION
J. Nekvasil, *Lieut., Czecho-Slovak Legion French Army*	*Croix de Guerre, Czecho-Slovak War Cross, Czecho-Slovak Military Medal.*
Carl Nielsen	
W. O'Grady	
V. Oldroyd	*Infantry*
J. Oleverus	
G. Olivo	
G. Page	*Air Service*
M. Palkovitch	
C. Parr	
Yarrow Pauch	*U. S. Navy*
R. W. Peaden	
O. Pergl	
J. W. Persons	*Air Service*
Chas. Peterka	*Artillery*
S. J. Peters	
A. Petersen	
A. Peterson	*384th Infantry*
K. L. Pohlman	*Captain 334th Infantry, 84th Division, A. E. F.*
R. G. Pollock, *Inf., 27th Div., A. E. F.*	*Two Citations.*
C. W. Potts	*Motor Transport Corps*
A. Przybylski	*U. S. Navy*
D. Quincinto	
G. Rabidoux	
George Randolph, *1st Lieut., 61st F. A.*	
F. N. Rappe	*Infantry*
J. Raspone	*58th Infantry, 4th Division*
H. Reinke	
W. Retzlaff	
Edward Reynolds	*Infantry*
Ira S. Reynolds	*Field Artillery* ★ *Died in Service*
Charles Rhoades	*112th Engineers*
T. Richards	
S. Richer	
W. Rimanoczy	*S. A. T. C. Case School*
C. Rodig	*Marines*
Joe Rohal	

NAME	ORGANIZATION
F. Romontio	*Infantry*
J. R. Rose	*332nd Infantry*
J. Rozanek	
B. Ryzetne	
Rocco Scattone	
A. Schmitz	
Henry Schneider	
Leland Schock	*Air Service*
Paul Schuster	
Warner Seely	*1st Lieutenant 317th M. O. R. S., A. E. F.*
J. Sekella	
C. Shimansky	*Artillery*
J. Shevel	
A. Shocki	
T. Sidorec	*348th Inf., 87th Div.*
R. Silhany	
G. Singer	*Motor Transport Corps*
Joe Sladky	*47th Infantry*
B. A. Smith	
L. C. Smith	
W. Smith	*U. S. Navy*
V. Smolka	
J. Sobodosh	*Signal Corps*
★M. Soinsky	*59th Infantry, A. E. F. Killed in Action*
A. Spadero	*347th Infantry*
J. V. Stambaugh	
S. Stefanchin	
L. Stober	
T. Stoll	
Ira B. Stock	*Air Service*
D. G. Stratton,	*135th F. A., A. E. F.*
Edward Stuckbauer	*U. S. Navy*
R. S. Stuntz	
D. Swain	
G. Swain	*Edgewood Arsenal*
W. R. Sweeley	*Officers Reserve*
Gabriel Szabo	
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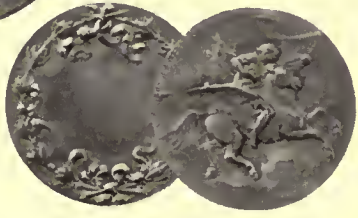

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